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Relevance scale ☐ ☐ ☐ ☐ ☐**1** [Collision detection and proximity queries](#)
 Sunil Hadap, Dave Eberle, Pascal Volino, Ming C. Lin, Stephane Redon, Christer Ericson
 August 2004 **ACM SIGGRAPH 2004 Course Notes SIGGRAPH '04**
Publisher: ACM PressFull text available: pdf(11.22 MB) Additional Information: [full citation](#), [abstract](#)

This course will primarily cover widely accepted and proved methodologies in collision detection. In addition more advanced or recent topics such as continuous collision detection, ADFs, and using graphics hardware will be introduced. When appropriate the methods discussed will be tied to familiar applications such as rigid body and cloth simulation, and will be compared. The course is a good overview for those developing applications in physically based modeling, VR, haptics, and robotics.

2 [Exploiting perception in high-fidelity virtual environments: Exploiting perception in high-fidelity virtual environments](#)
Additional presentations from the 24th course are available on the citation page

 Mashhuda Glencross, Alan G. Chalmers, Ming C. Lin, Miguel A. Otaduy, Diego Gutierrez
 July 2006 **ACM SIGGRAPH 2006 Courses SIGGRAPH '06**
Publisher: ACM PressFull text available: pdf(5.07 MB) mov(68:6 MIN) Additional Information: [full citation](#), [appendices and supplements](#), [abstract](#), [references](#), [cited by](#), [index terms](#)

The objective of this course is to provide an introduction to the issues that must be considered when building high-fidelity 3D engaging shared virtual environments. The principles of human perception guide important development of algorithms and techniques in collaboration, graphical, auditory, and haptic rendering. We aim to show how human perception is exploited to achieve realism in high fidelity environments within the constraints of available finite computational resources. In this course w ...

Keywords: collaborative environments, haptics, high-fidelity rendering, human-computer interaction, multi-user, networked applications, perception, virtual reality

3 [Three-dimensional object recognition](#)

Paul J. Besl, Ramesh C. Jain

March 1985 **ACM Computing Surveys (CSUR)**, Volume 17 Issue 1

**Publisher:** ACM Press

Full text available: pdf(7.76 MB)

Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#), [review](#)

A general-purpose computer vision system must be capable of recognizing three-dimensional (3-D) objects. This paper proposes a precise definition of the 3-D object recognition problem, discusses basic concepts associated with this problem, and reviews the relevant literature. Because range images (or depth maps) are often used as sensor input instead of intensity images, techniques for obtaining, processing, and characterizing range data are also surveyed.



4 [Level set and PDE methods for computer graphics](#)

David Breen, Ron Fedkiw, Ken Museth, Stanley Osher, Guillermo Sapiro, Ross Whitaker
August 2004 **ACM SIGGRAPH 2004 Course Notes SIGGRAPH '04****Publisher:** ACM Press

Full text available: pdf(17.07 MB)

Additional Information: [full citation](#), [abstract](#), [citations](#)

Level set methods, an important class of partial differential equation (PDE) methods, define dynamic surfaces implicitly as the level set (iso-surface) of a sampled, evolving nD function. The course begins with preparatory material that introduces the concept of using partial differential equations to solve problems in computer graphics, geometric modeling and computer vision. This will include the structure and behavior of several different types of differential equations, e.g. the level set eq ...



5 [High dynamic range imaging](#)

Paul Debevec, Erik Reinhard, Greg Ward, Sumanta Pattanaik
August 2004 **ACM SIGGRAPH 2004 Course Notes SIGGRAPH '04****Publisher:** ACM Press

Full text available: pdf(20.22 MB)

Additional Information: [full citation](#), [abstract](#)

Current display devices can display only a limited range of contrast and colors, which is one of the main reasons that most image acquisition, processing, and display techniques use no more than eight bits per color channel. This course outlines recent advances in high-dynamic-range imaging, from capture to display, that remove this restriction, thereby enabling images to represent the color gamut and dynamic range of the original scene rather than the limited subspace imposed by current monitor ...



6 [Special issue: AI in engineering](#)

D. Sriram, R. Joobani
April 1985 **ACM SIGART Bulletin**, Issue 92**Publisher:** ACM Press

Full text available: pdf(8.79 MB)

Additional Information: [full citation](#), [abstract](#)

The papers in this special issue were compiled from responses to the announcement in the July 1984 issue of the SIGART newsletter and notices posted over the ARPAnet. The interest being shown in this area is reflected in the sixty papers received from over six countries. About half the papers were received over the computer network.



7 [An updated cross-indexed guide to the ray-tracing literature](#)

L. Richard Speer
January 1992 **ACM SIGGRAPH Computer Graphics**, Volume 26 Issue 1**Publisher:** ACM Press

Full text available: pdf(2.94 MB)

Additional Information: [full citation](#), [index terms](#)

8 Surfaces from contours



David Meyers, Shelley Skinner, Kenneth Sloan
July 1992 **ACM Transactions on Graphics (TOG)**, Volume 11 Issue 3

Publisher: ACM Press

Full text available: [pdf\(2.04 MB\)](#)

Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#), [review](#)

This paper is concerned with the problem of reconstructing the surfaces of three-dimensional objects, given a collection of planar contours representing cross-sections through the objects. This problem has important applications in biomedical research and instruction, solid modeling, and industrial inspection. The method we describe produces a triangulated mesh from the data points of the contours which is then used in conjunction with a piecewise parametric surface-fitting algoiri ...

Keywords: branching problem, branching surfaces, correspondence problem, meshes, minimum spanning tree, surface fitting, surface reconstruction, tiling

9 A Characterization of Ten Hidden-Surface Algorithms



Ivan E. Sutherland, Robert F. Sproull, Robert A. Schumacker
March 1974 **ACM Computing Surveys (CSUR)**, Volume 6 Issue 1

Publisher: ACM Press

Full text available: [pdf\(4.47 MB\)](#)

Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

10 Video-based rendering: Video-based rendering



Marcus Magnor, Marc Pollefeys, German Cheung, Wojciech Matusik, Christian Theobalt
July 2005 **ACM SIGGRAPH 2005 Courses SIGGRAPH '05**

Publisher: ACM Press

Full text available: [pdf\(5.15 MB\)](#)

Additional Information: [full citation](#)

11 Geometric programming: a programming approach to geometric design



Alberto Paoluzzi, Valerio Pascucci, Michele Vicentino
July 1995 **ACM Transactions on Graphics (TOG)**, Volume 14 Issue 3

Publisher: ACM Press

Full text available: [pdf\(2.54 MB\)](#)

Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

This article presents a functional programming approach to geometric design with embedded polyhedral complexes. Its main goals are to show the expressive power of the language as well as its usefulness for geometric design. The language, named PLASM (the Programming Language for Solid Modeling), introduces a very high level approach to "constructive" or "generative" modeling. Geometrical objects are generated by evaluating some suitable language expressions. Because ...


Keywords: design language, functional programming, generative modeling, geometric design, polyhedra, solid modeling, variational geometry

12 Model-based recognition in robot vision



Roland T. Chin, Charles R. Dyer
March 1986 **ACM Computing Surveys (CSUR)**, Volume 18 Issue 1

Publisher: ACM Press

Full text available:  pdf(4.94 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#), [review](#)

This paper presents a comparative study and survey of model-based object-recognition algorithms for robot vision. The goal of these algorithms is to recognize the identity, position, and orientation of randomly oriented industrial parts. In one form this is commonly referred to as the "bin-picking" problem, in which the parts to be recognized are presented in a jumbled bin. The paper is organized according to 2-D, 2½-D, and 3-D object representations, which are used as the basis for ...

13 Model-based object recognition in dense-range images—a review



Farshid Arman, J. K. Aggarwal

March 1993 **ACM Computing Surveys (CSUR)**, Volume 25 Issue 1

Publisher: ACM Press

Full text available:  pdf(3.42 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#), [review](#)

The goal in computer vision systems is to analyze data collected from the environment and derive an interpretation to complete a specified task. Vision system tasks may be divided into data acquisition, low-level processing, representation, model construction, and matching subtasks. This paper presents a comprehensive survey of model-based vision systems using dense-range images. A comprehensive survey of the recent publications in each subtask pertaining to dense-range image object recogni ...

Keywords: 3D object recognition, 3D representations, CAD-based vision, dense-range images, image understanding

14 Shape-based retrieval and analysis of 3D models



Thomas Funkhouser, Michael Kazhdan

August 2004 **ACM SIGGRAPH 2004 Course Notes SIGGRAPH '04**

Publisher: ACM Press

Full text available:  pdf(12.56 MB) Additional Information: [full citation](#), [abstract](#)

Large repositories of 3D data are rapidly becoming available in several fields, including mechanical CAD, molecular biology, and computer graphics. As the number of 3D models grows, there is an increasing need for computer algorithms to help people find the interesting ones and discover relationships between them. Unfortunately, traditional text-based search techniques are not always effective for 3D models, especially when queries are geometric in nature (e.g., find me objects that fit into thi ...

15 Computing with geometry as an undergraduate course: a three-year experience



John L. Lowther, Ching-Kuang Shene

February 2001 **ACM SIGCSE Bulletin , Proceedings of the thirty-second SIGCSE technical symposium on Computer Science Education SIGCSE '01**, Volume 33 Issue 1

Publisher: ACM Press

Full text available:  pdf(503.46 KB) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

16 Geographic Data Processing



George Nagy, Sharad Wagle


June 1979 **ACM Computing Surveys (CSUR)**, Volume 11 Issue 2

Publisher: ACM Press


Full text available:  pdf(4.20 MB) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

17 Algorithms for congruent sphere packing and applications Danny Z. Chen, Xiaobo Hu, Yingping Huang, Yifan Li, Jinhui XuJune 2001 **Proceedings of the seventeenth annual symposium on Computational geometry SCG '01****Publisher:** ACM PressFull text available:  pdf(290.09 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)


The problem of packing congruent spheres (i.e., copies of the same sphere) in a bounded domain arises in many applications. In this paper, we present a new pack-and-shake scheme for packing congruent spheres in various bounded 2-D domains. Our packing scheme is based on a number of interesting ideas, such as a trimming and packing approach, optimal lattice packing under translation and/or rotation, shaking procedures, etc. Our packing algorithms have fairly low time complexities. In cert ...

18 Rendering biological iridescences with RGB-based renderers Yinlong SunJanuary 2006 **ACM Transactions on Graphics (TOG)**, Volume 25 Issue 1**Publisher:** ACM PressFull text available:  pdf(801.45 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Brilliant iridescent colors occur on many biological objects. Current RGB-based graphics renderers are not sufficient to simulate such phenomena. This is because biological iridescences are caused by interference or diffraction, which requires wavelength information to describe. In this article, we propose an iridescent shading process that allows to render biological iridescences with RGB-based renderers. The key ideas are to construct spectra from colors and to use a wavelength-dependent model ...

Keywords: Biological iridescence, RGB, interference, spectra, structural color**19 An introduction to sketch-based interfaces: A suggestive interface for 3D drawing** Takeo Igarashi, John F. HughesJuly 2006 **ACM SIGGRAPH 2006 Courses SIGGRAPH '06****Publisher:** ACM PressFull text available:  pdf(560.37 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

This paper introduces a new type of interface for 3D drawings that improves the usability of gestural interfaces and augments typical command-based modeling systems. In our suggestive interface, the user gives hints about a desired operation to the system by highlighting related geometric components in the scene. The system then infers possible operations based on the hints and presents the results of these operations as small thumbnails. The user completes the editing operation simply by clicking ...

Keywords: 3D drawing, gestural interface, interaction technique, prediction, user interface design**20 Papers: 3D drawing: A suggestive interface for 3D drawing** Takeo Igarashi, John F. HughesNovember 2001 **Proceedings of the 14th annual ACM symposium on User interface software and technology UIST '01****Publisher:** ACM PressFull text available:  pdf(1.51 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

This paper introduces a new type of interface for 3D drawings that improves the usability of gestural interfaces and augments typical command-based modeling systems. In our suggestive interface, the user gives hints about a desired operation to the system by highlighting related geometric components in the scene. The system then infers possible operations based on the hints and presents the results of these operations as small thumbnails. The user completes the editing operation simply by clicking ...

Keywords: 3D drawing, gestural interface, interaction technique, prediction, user interface design

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